June 4, 1957 W. H. LLOYD 2,794,231

PORTABLE EQUIPMENT FOR MAKING CONCRETE PILES

Filed Oct. 15, 1952

5 Sheets-Sheet 1

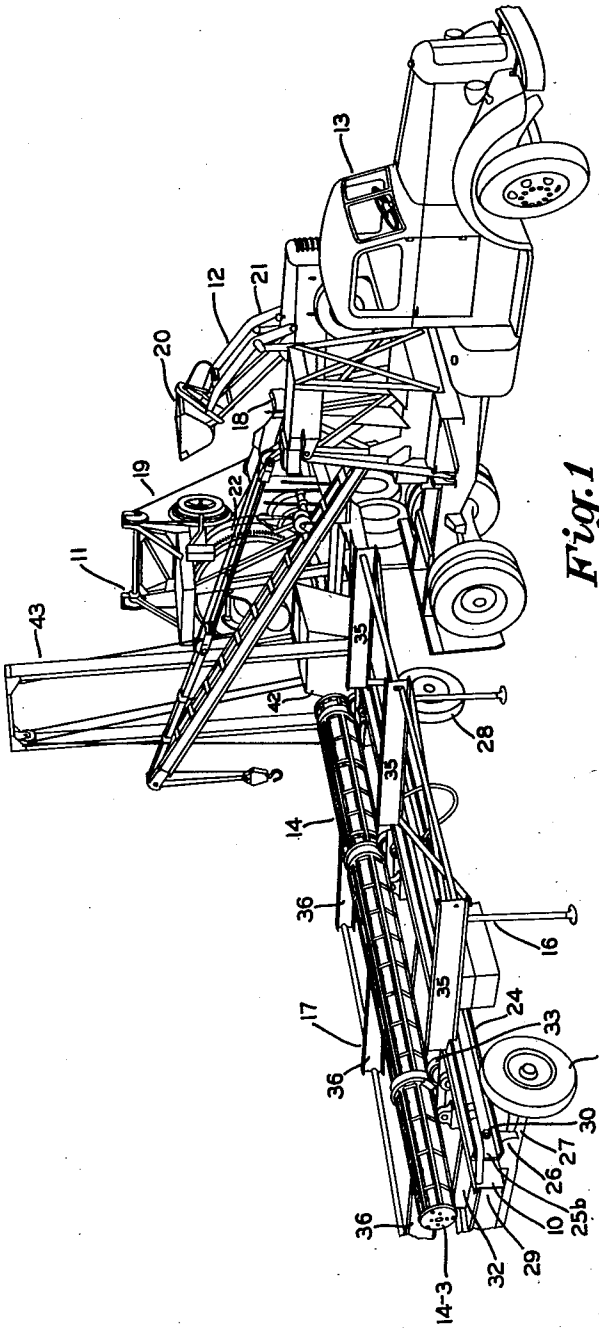


Fig. 1

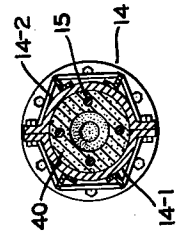


Fig. 3

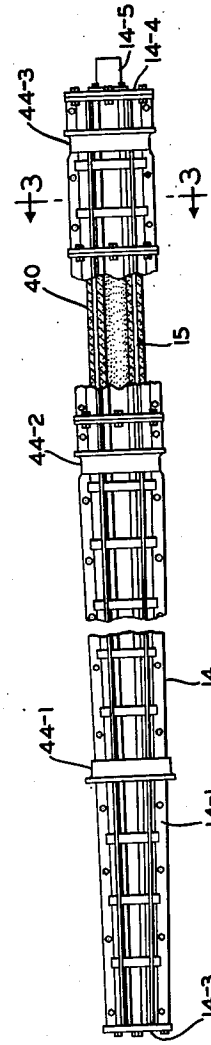


Fig. 2

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5 Sheets-Sheet 2

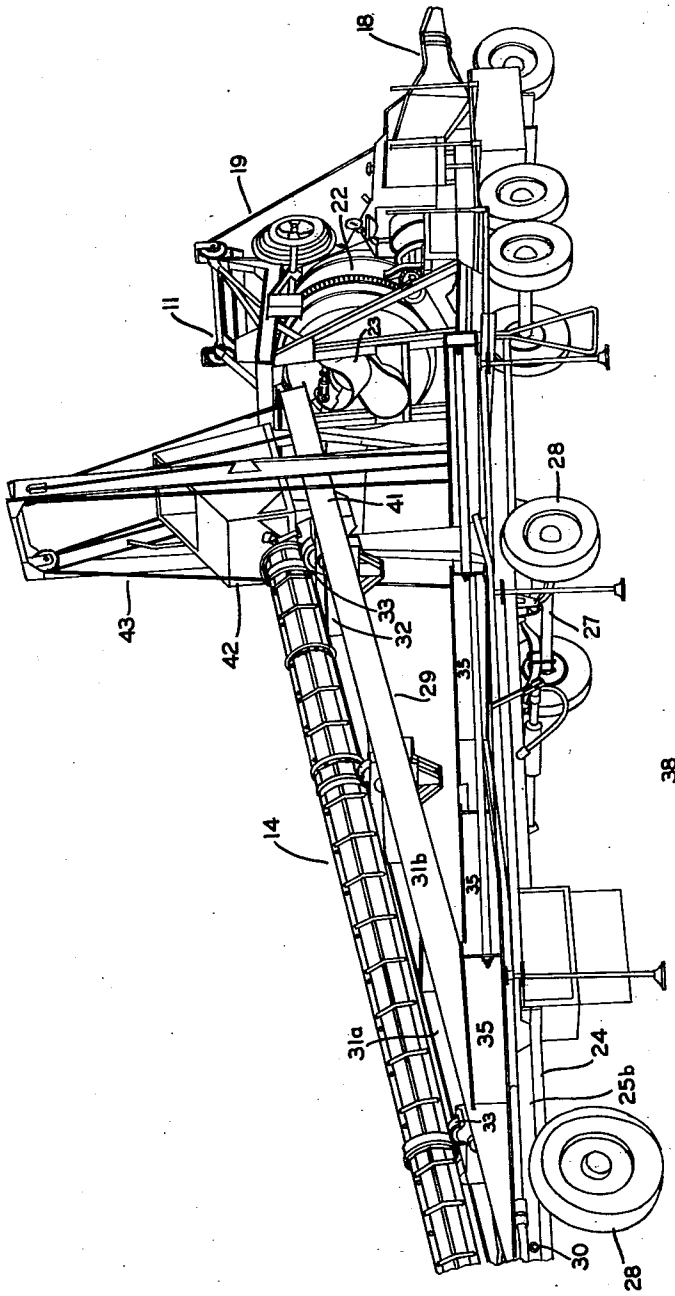


Fig. 4

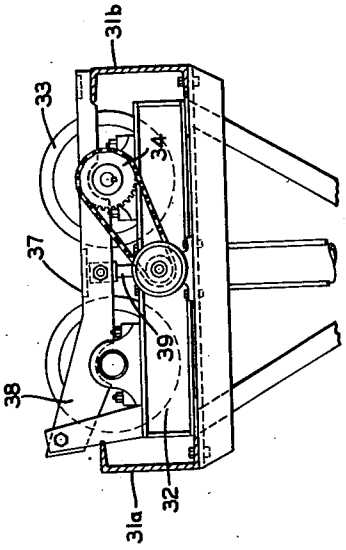


Fig. 6

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PORTABLE EQUIPMENT FOR MAKING CONCRETE PILES

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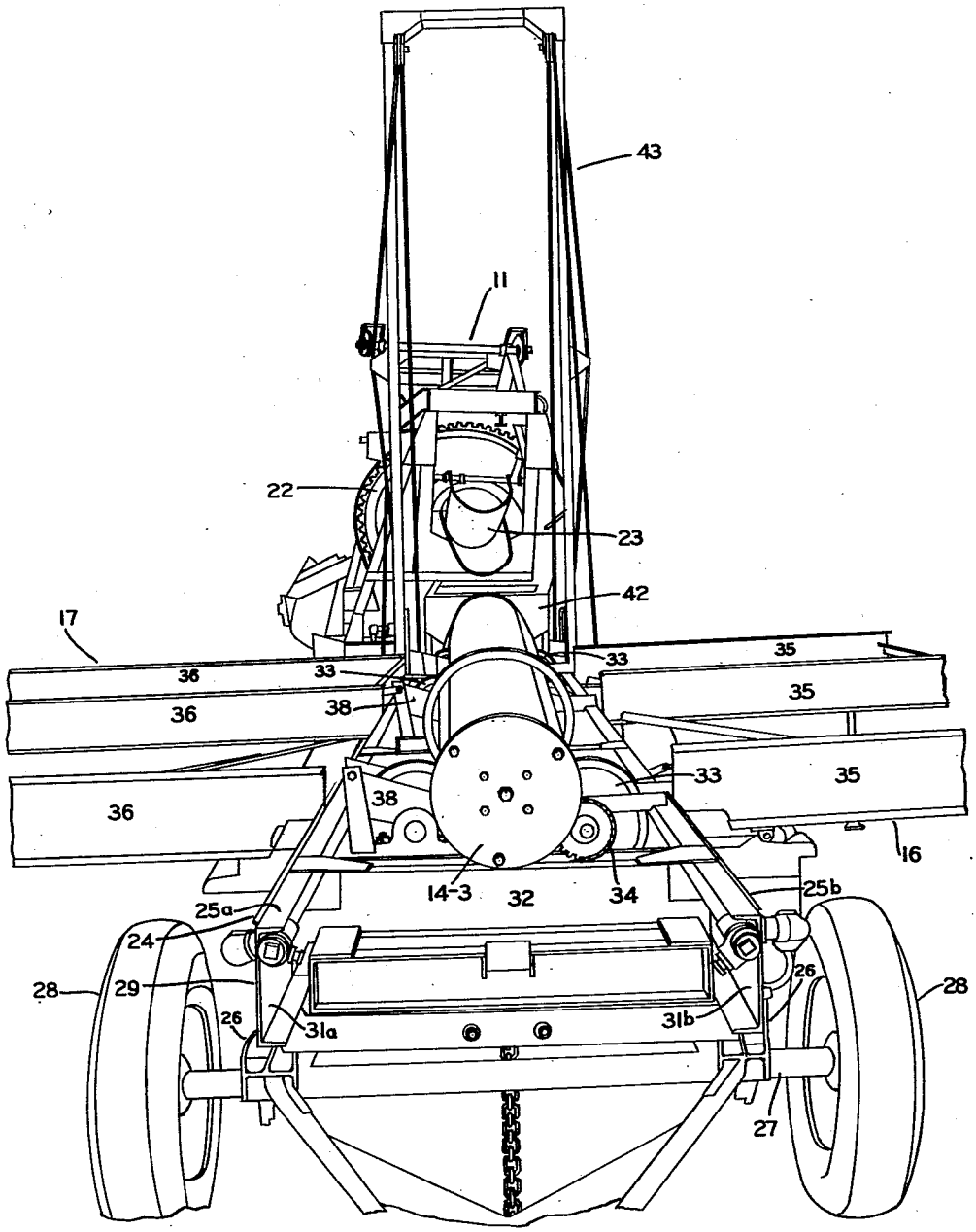


Fig. 5

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PORTABLE EQUIPMENT FOR MAKING CONCRETE PILES

Filed Oct. 15, 1952 5 Sheets-Sheet 4

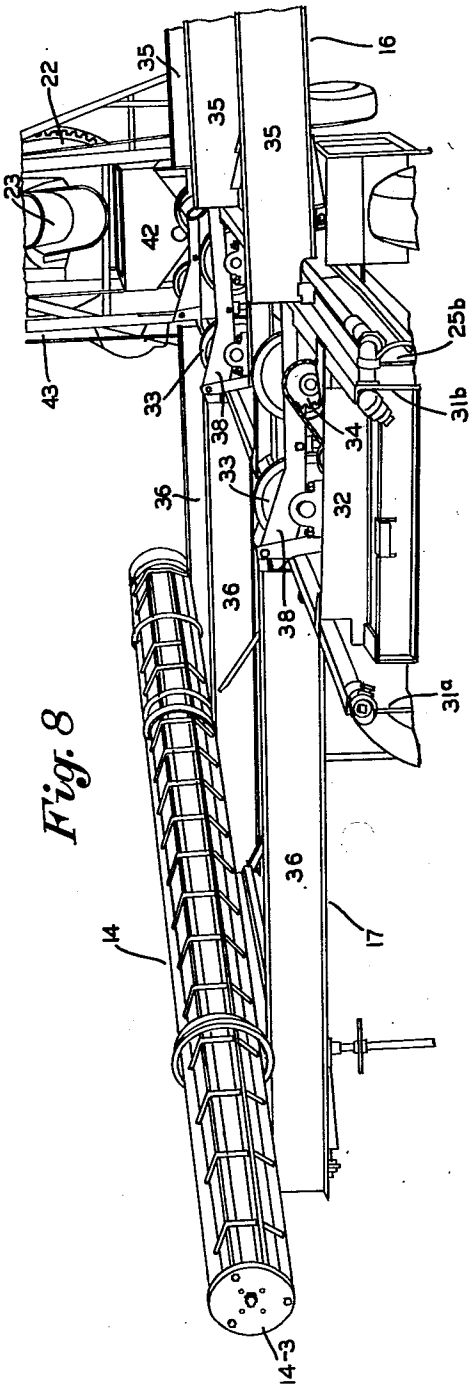


Fig. 8

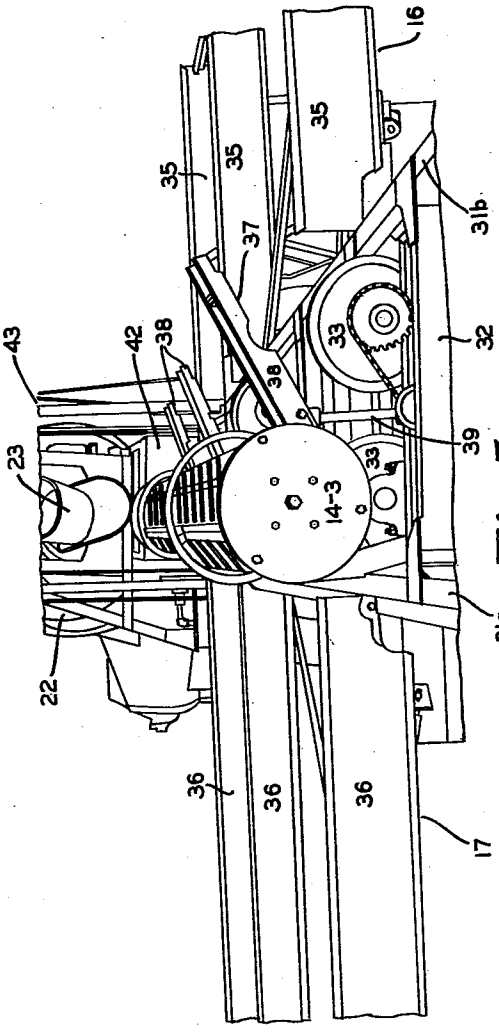


Fig. 7

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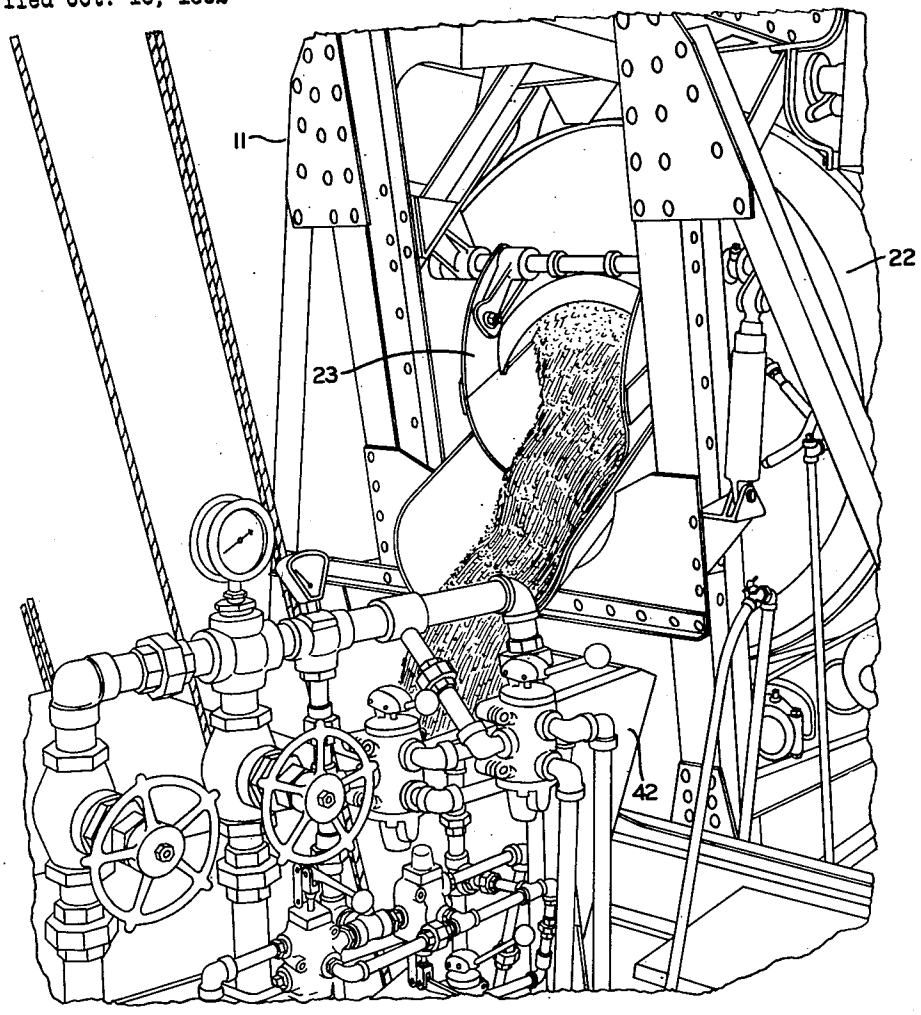


Fig. 9

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2,794,231

PORTABLE EQUIPMENT FOR MAKING CONCRETE PILES

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Application October 15, 1952, Serial No. 314,789

4 Claims. (Cl. 25—30)

The invention or discovery relates to portable spinning equipment for making concrete piles. The equipment may be used, at the place or area where piles are being driven, for instance, at a bridge.

In usual methods of making precast or spun concrete piles at a factory, the aggregate, sand, and cement, and the reinforcing steel must be first assembled at the factory, and the completed piles must be transported and handled from the factory usually a considerable distance to the place of use. The cost of assembling the aggregate, sand, and cement, and the reinforcing steel at the factory, and transporting and handling the completed piles from the factory to the job or place of use constitutes a considerable portion of the cost of delivering to the job usual precast or spun concrete piles.

The objects of the present invention or discovery include the provision of improved portable spinning equipment for making spun concrete piles at the place where the piles are to be used, and thereby reducing cost, since aggregate, sand, and cement, and reinforcing steel may be assembled directly on the job, and water is normally available on the job.

The cranes or hoists which are on the job for other purposes may be used for handling the piles.

Thus, the necessity of assembling aggregate, sand, and cement, and reinforcing steel at a distant factory, and transporting and handling completed piles from the distant factory to the job is eliminated.

It is a further object of the present invention or discovery to provide such improved portable concrete pile spinning equipment having a simplified and coordinated arrangement of units, permitting economical manufacture and maintenance, and convenience in use.

The foregoing and other objects are attained by the portable spinning equipment for making concrete piles, equipment units, parts, combinations, and sub-combinations which comprise the present invention or discovery, and the nature of which is set forth in the following general statement, and preferred embodiments of which are set forth in the following description, and which are particularly and distinctly pointed out and set forth in the appended claims forming part hereof.

In general terms, the method of making concrete piles and the like of the present invention or discovery includes aligning the discharge chute of a mixer with a hopper, aligning the discharge chute of the hopper with the inlet end opening of a rotatable spinning mold in a spinning position, delivering a charge of concrete from the mixer into the hopper, simultaneously raising the hopper and adjacent inlet end of the mold from the spinning position so as to incline the mold downwardly from the hopper, flowing the charge of concrete from the hopper into the raised inlet end opening of the mold, lowering the hopper and raised end of the mold to the spinning position, closing the inlet end opening of the mold, and rotating the spinning mold in the spinning position.

The nature of the improved portable spinning equipment for making concrete piles and the like of the present

invention or discovery may be stated in general terms as including a frame, wheels preferably mounting the frame. A longitudinally extending spinning table has a pivotal mounting at one end on the frame. The spinning table includes longitudinally spaced pairs of mounting and spinning rollers. A longitudinally extending tubular mold has a closed end adjacent the pivotal axis of the spinning table. Wheel rings on the mold roll on the pairs of spinning table rollers. The other end of the mold is open. The spinning table has an extension adjacent the inlet opening end of the mold. A charging hopper is mounted on the spinning table extension, the charging hopper having a discharge opening adapted for communication with the inlet end opening of the mold. Means are provided for raising the spinning table extension and the charging hopper thereon with the inlet end of the mold so as to pivot the spinning table about its pivotal mounting. A concrete mixer has a discharge chute communicating with the hopper when the hopper is in its lowered position.

By way of example, embodiments of the improved portable spinning equipment of the present invention or discovery are illustrated in the accompanying drawings forming part hereof in which

Figure 1 is a perspective view with portions broken away showing all the mobile units required for the portable spinning equipment;

Fig. 2 is a plan view with portions broken away of one of the molds after a pile has been spun formed therein;

Fig. 3 is a transverse sectional view thereof, as on line 3—3, Fig. 2;

Fig. 4 is a perspective view with portions broken away showing the aligned concrete mixer, charging hopper, and mold in the raised position of the charging hopper and mold;

Fig. 5 is an end perspective view with portions broken away of the aligned units of the equipment during spinning operation of the mold;

Fig. 6 is a detached view showing the drive for one of the spinning rollers on the spinning table;

Fig. 7 is a fragmentary view similar to Fig. 5 showing the ejector mechanism removing the mold from the spinning table to the curing rack at one side of the spinning table;

Fig. 8 is a fragmentary perspective view showing the mold on the curing rack; and

Fig. 9 is a fragmentary perspective view showing mixed concrete being charged from the mixer into the mold charging hopper, and also the group assembly of all control valves and gauges for operating the entire machine made up of the aligned units.

Similar numerals refer to similar parts throughout the drawings.

In Fig. 1 is illustrated all the mobile units required for the portable spinning equipment, and these mobile units include the wheel mounted spinning machine indicated generally by **10**, the wheel mounted concrete mixer indicated generally by **11**, the wheel mounted and self-propelled loader indicated generally by **12**, and the truck crane indicated generally by **13**.

These mobile units **10**, **11**, **12**, and **13**, are used to handle, charge with concrete, spin, and eject to a curing frame on the spinning machine **10**, successive elongated tubular molds, each indicated generally by **14**.

One of the tubular molds **14** is shown with its longitudinal axis substantially horizontal in a first and spinning position on the spinning machine **10**, in Fig. 1. Another of the tubular molds **14** is shown in Figs. 2 and 3, after a concrete pile has been spun therein.

The illustrated improved portable spinning equipment is used for the production of concrete piles at the place where the piles are being driven. It may be used for

other purposes, such as the production of piles, poles, or posts, at any place, since the spinning machine **10** in conjunction with the concrete mixer **11**, constitutes generally a straight production line apparatus for producing spun concrete products.

The truck crane **13** is of usual construction and operation, and is used to handle and transport the molds **14** from the place where the steel reinforcing, indicated generally by **15** in Figs. 2 and 3, is inserted in the empty molds, to a charging table indicated generally by **16**, which is part of and located at one side of the spinning machine **10**.

From the charging table **16**, each mold **14** is successively rolled to the first and spinning position on the spinning machine shown in Fig. 1. As hereinafter set forth in detail, after being placed at the first and spinning position, each mold **14** is filled with a charge of concrete, swung up to a second inclined position and down to the first and spinning position, spun, and then ejected to a curing frame indicated generally by **17**, and which is part of and located at the other side of the spinning machine **10**.

The concrete mixer **11** is generally of usual construction and operation, and includes a skip or open topped receptacle **18** having an inner end which is mounted for pivoting about a horizontal axis. Hoist means indicated generally by **19** raise and lower the outer end of the mixer skip **18**. In Figs. 1 and 4, the skip **18** is shown in its lowered position, ready to receive a charge of concrete mix or aggregates.

For this purpose the self-propelled loader **12** is utilized. The loader **12** is of usual construction and operation, and includes a dump bucket **20** operatively mounted at the end of an upwardly and downwardly swinging boom **21**. The loader **12** is preferably equipped with a weighing gauge attachment for measuring the ingredients of the concrete mix or aggregates. The loader **12** is used in the usual manner to fill the concrete mixer skip **18** in its lowered position with a charge of concrete mix or aggregates.

When filled with a charge of concrete mix or aggregates, the mixer skip **18** is hoisted to an elevated position from which the charge of concrete mix or aggregates dumps into the drum or barrel **22** of the concrete mixer **11**. The drum or barrel **22** rotates and mixes the charge of concrete therein in the usual manner.

The concrete mixer **11** is equipped with a usual upwardly and downwardly swinging discharge chute **23**, from which the measured charge of mixed concrete may be discharged to the spinning machine as hereinafter set forth in detail.

The spinning machine **10** includes a frame indicated generally by **24**, and including a pair of laterally spaced longitudinally extending beam members **25***a* and **25***b* from each end of each of which a strut **26** depends. At each end of the frame, a laterally extending axle **27** is located, each strut **26** at the same end of the frame having its lower end connected to the axle. At each end of each axle, there is rotatably mounted in the usual manner a usual wheel **28**.

As shown in the drawings, the charging table **16** extends laterally from the right side of the frame **24**, and the curing frame **17** extends laterally from the left side of the frame **24**.

The spinning table, indicated generally by **29**, extends longitudinally between the inner vertical planes of the frame beam members **25***a* and **25***b*, and pivot means **30** pivotally mount one end of the spinning table **29** on the frame beam members **25***a* and **25***b* for pivotally swinging the spinning table **29** about a horizontal axis. The spinning machine **10** is generally aligned with the concrete mixer **11**, and the pivot means **30** is at the far end of the spinning machine **10**, with respect to the concrete mixer **11** so that the near end of the spinning table **29** may be raised and lowered with respect to the discharge chute **23** of the concrete mixer **11**.

The spinning table **29** includes laterally spaced longitudinally extending beam members **31***a* and **31***b*, and a plurality of cross members **32**. Three pairs of laterally spaced and aligned rollers **33**, are longitudinally spaced from each other, and operatively mounted between the spinning table beam members **31***a* and **31***b*. As shown, each pair of rollers **33** is adjacent and mounted on one of the cross members **32**. Power drive means **34** are provided for one of each pair of rollers **33**.

The charging table **16** includes three laterally extending rail members **35**, each aligned with one of the pairs of laterally aligned rollers **33**.

Similarly, the curing frame **17** includes three laterally extending rail members **36**, each aligned with one of the pairs of laterally aligned rollers **33**.

Adjacent each pair of rollers **33**, there is operatively mounted between the spinning table beam members **31***a* and **31***b*, an ejector mechanism, indicated generally by **37**, and which is adapted to eject each elongated tubular mold **14** seated between the pairs of rollers **33**, from the rollers to the curing frame **17**.

As best shown in Figs. 7 and 8, each ejector mechanism **37** includes a pair of lift levers **38**, each pivoted on the shaft of one of the left hand rollers **33**. Each lift lever **38** extends crosswise of the spinning table **29** towards the charging table **16**. Hydraulic cylinder means including a reciprocating piston rod **39** connected with the lift levers **38** of each ejector mechanism, are utilized to swing the levers **38** up and down.

As best shown in Figs. 2 and 3, each mold **14** is constituted by separable elongated half circumferential segments **14–1** and **14–2**. The half circumferential segments **14–1** and **14–2** are longitudinally tapered as shown, for making a tapered pile **40**, in which is embedded the steel reinforcing **15** in the finished pile. The nose end of the mold **14** is closed by a cover plate **14–3**. The nose end of the mold is at the far end of the spinning machine during a spinning operation. The cap end of the mold **14** is connected with an apertured cover plate **14–4**, the aperture or opening **14–5** of which is rectangular.

The spinning table **29** has an extension **41** which extends beyond the pair of rollers **33** nearest the concrete mixer **11**. On this spinning table extension **41**, there is mounted a charging hopper **42**, which is an upwardly opening receptacle intermediate the concrete mixer **11** and the nearest set of rollers **33**. The hopper **42** has a rectangular discharge duct which may be separably inserted in the rectangular opening **14–5** of a mold **14** positioned on the rollers **33**.

Means are provided for raising and lowering the spinning table extension **41** so as to swing the spinning table **29** up and down on the pivot means **30** from a first and lower position of the spinning table to a second and upper inclined position of the spinning table, and vice versa. As shown, the raising and lowering means is a power operated hoist indicated generally by **43**.

Each mold **14** includes three flanged wheels **44–1**, **44–2**, and **44–3**. The wheel **44–1** is nearest the nose end of the mold, and its flange is at the end of the wheel periphery nearest the nose end of the mold. The flanges of the other wheels **44–2** and **44–3** are at the ends of their peripheries nearest the cap end of the mold.

The wheels **44–1**, **44–2**, **44–3**, are longitudinally spaced on each mold **14**, the same distance as the longitudinal spacing of the charging table rail members **35**, the spinning table pairs of rollers **33**, and the curing frame rail members **36**.

In using the improved portable spinning equipment to carry out the improved method hereof, one of the molds **14** in which has been placed the steel reinforcing **15** including prestressed tension rods, is carried by the truck crane **13** to the charging table **16**. Here the mold **14** is

lowered so that its wheels roll on the rail members 35 of the charging table.

From the charging table 16, the mold 14 is rolled into position on the rollers 33 of the spinning table 29, the spinning table 29 being in its lowered position as shown in Figs. 1 and 5.

Meanwhile, a measured charge of concrete has been mixed in the mixer 11. From the mixer 11, through its lowered discharge chute 23, the charge of mixed concrete is dropped into the hopper 42 through its upper opening.

The discharge duct of the hopper 42 is then inserted in the rectangular opening 14–5 of the mold 14 positioned on the rollers 33.

The hoist 43 is then operated to raise the spinning table extension 41, and with it the hopper 42 and the connected end of the mold 14, to the positions shown in Fig. 4, where the charge of concrete flows into the mold 14.

The spinning table extension 41 is then lowered to the spinning position shown in Fig. 5. Here, the hopper 42 is disconnected from the mold 14, and the opening 14–5 of the mold is plugged. Then the spinning rollers 33 are rotated and thus rotate and spin the concrete charged mold 14 thereon.

The charged mold is spun for a suitable period, which may be from twenty minutes to one-half hour. The concrete in the mold is thrown outwardly during the spinning operation, and excess water is forced inwardly, thus compacting and densifying the concrete pile formed in the mold. Initial set takes place during the spinning operation.

The mold 14 is then ejected from the spinning table 29 by operation of the ejector mechanisms 37 as shown in Fig. 7. The ejected mold 14 rolls on the rail members 36 of the curing frame 17 to the position shown in Fig. 8. Here excess water from the spun pile 40 is permitted to drain out. After a proper period of time the mold is stripped from the spun pile 40.

The spun pile 40 is then permitted to cure for from two to three weeks. The cured spun pile 40 may then be driven with a pile driver directly without the use of a mandrel, in the same manner that wooden or steel piles are driven.

Fig. 9 illustrates mixed concrete flowing from the mixer 11 into the mold charging hopper 42. Also Fig. 9 illustrates the group assembly of all control valves and gauges for operating the entire machine.

I claim:

1. Apparatus for making concrete products and the like, including a concrete mixer having a discharge chute, a mold charging upwardly opening hopper having a discharge duct, a rotatable spinning mold having an inlet end and an opening in the inlet end, the inlet end of the mold being adjacent the hopper, and means for separably mounting and rotating the spinning mold; a spinning table mounting the spinning mold mounting and rotating means and the mold thereon, the spinning table including an extension beyond the inlet end of the mold, and the spinning table extension mounting the hopper; and means for swinging the spinning table about an axis of pivoting between a first spinning position and a second inclined position in which the spinning table extension is above the axis of pivoting; the discharge chute of the concrete mixer being aligned and movable for discharging mixed concrete into the upwardly opening hopper, and the discharge duct of the hopper being separably connectable with the inlet end opening of the mold.

2. Apparatus for making concrete products and the like, including a mold charging upwardly opening hopper having a discharge duct, a rotatable spinning mold having an inlet end and an opening in the inlet end, the inlet end of the mold being adjacent the hopper, and means for separably mounting and rotating the spinning mold; a spinning table mounting the spinning mold mounting and rotating means and the mold thereon, the spinning table including an extension beyond the inlet end of the mold, and the spinning table extension mounting the hopper; and means for swinging the spinning table about an axis of pivoting between a first spinning position and a second inclined position in which the spinning table extension is above the axis of pivoting; the discharge duct of the hopper being separably connectable with the inlet end opening of the mold.

3. Apparatus for making concrete products and the like, including a frame, a longitudinally extending spinning table, pivot means adjacent one end of the spinning table, the pivot means mounting the spinning table on the frame for pivoting about a horizontal axis, rotatable roller means on the spinning table, a longitudinally extending spinning mold separably mounted for rotation on and by the rotatable roller means, the spinning mold having an inlet opening adjacent the other end of the frame, means for swinging the spinning table about its axis of pivoting between a first spinning position and a second inclined position in which the other end of the spinning table is above the axis of pivoting, the spinning table including a lengthwise extension beyond the location of the inlet end of the spinning mold, and an upwardly opening hopper mounted on the spinning table extension, the hopper having a discharge duct adapted for separable communicating connection with the inlet opening of the mold.

4. Apparatus for making concrete products and the like, including a frame, a longitudinally extending spinning table, pivot means adjacent one end of the spinning table, the pivot means mounting the spinning table on the frame for pivoting about a horizontal axis, means on the spinning table for separably mounting and rotating a spinning mold having an inlet opening, the mold mounting and rotating means including longitudinally spaced pairs of laterally aligned and spaced rollers, one of the pairs of rollers being located adjacent the other end of the frame, means for swinging the spinning table about its axis of pivoting between a first spinning position and a second inclined position in which the other end of the spinning table is above the axis of pivoting, the spinning table including a lengthwise extension beyond the pair of rollers adjacent the other end of the spinning table, and an upwardly opening hopper mounted on the spinning table extension, the hopper having a discharge duct adapted for separable communicating connection with the inlet opening of a mold mounted on the rollers with its inlet opening adjacent the other end of the spinning table.

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